iCAP 6000 Series
Pre-Installation Manual

Version 4.2

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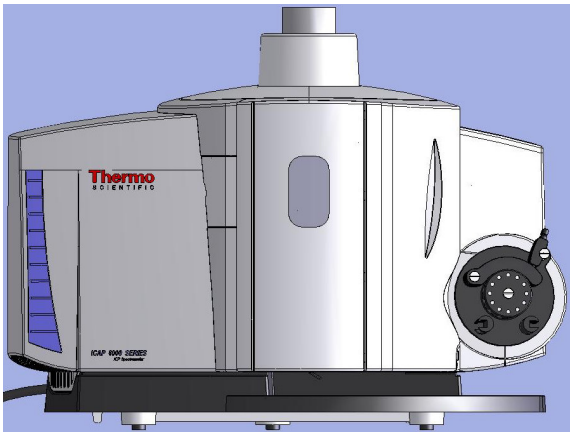

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Chapter 1
Introduction

This manual is designed to help ensure that your iCAP 6000 Series ICP-OES Spectrometer will be installed efficiently and will be able to meet your requirements quickly and completely.

It will minimise installation time if the services and facilities detailed here are available before the equipment is delivered.

Properly installed and maintained, your system will provide you with years of reliable service. Please inform your local Thermo Fisher organisation what aspects of support are most important to you and a tailored agreement can be provided to prolong the life of your instrument.

This manual describes the environment and the resources required at the installation site of the iCAP 6000 Series ICP-OES Spectrometer and associated equipment. Safety requirements for the installation are also detailed.

WARNING: The installation of all services must comply with the appropriate rules and regulations required by the local authorities responsible for those services in the workplace, at the installation site. An installation engineer is not responsible for the fitting, or compliance of the facilities, or services.

The choice of an operating site for the instrument will be influenced by local considerations for example, ease of access and availability of electrical power.

Logical planning of the installation can save both time and money. The objective of this manual is to provide information that will enable the best site to be chosen and to highlight the essential requirements.

If further information or advice is required, contact your local Thermo Fisher organisation. A list of Thermo Fisher organisations and agents can be found on http://www.thermofisher.com.

Installation of the system will include some familiarisation training; however comprehensive method development and software training will require additional training that should be ordered separately.

Chapter 2
System Accessories

Required:

- Recirculating chiller unit (see specification)
- Data Station (see specification)

Optional:

- Cetac ASX-520 Autosampler (requires dedicated RS232 on Data Station)
- Cetac ASX-260 Autosampler (requires dedicated RS232 on Data Station)
- Cetac EXR-8 Autosampler (requires dedicated RS232 on Data Station)
- Cetac ASX 1400 Autosampler (Stirring)
- Cetac U-6000AT+ Ultrasonic Nebuliser
- Elemental Scientific, Inc. SC SC4 Autosampler
- Elemental Scientific, Inc. SC4 Fast Autosampler
- Argon Humidifier
- SSEA – Solid sampling device (requires dedicated RS232 on Data Station and iCAP 6000 accessory board)
- Laser – Solid sampling device (requires dedicated RS232 on Data Station and iCAP 6000 accessory board)
- High Solids Sample Introduction kit
- HF Acid Sample Introduction kit
- Organics Sample Introduction Kit
- Volatile Organics Sample Introduction kit

Please request site requirement guides for any purchased accessories

Chapter 3
Transportation

The spectrometer is supplied with all compatible accessories that have been purchased to meet the customer's system requirements. Items may be shipped in separate packages.

WARNING: All items should be transported to the installation site on pallets, in their original packaging and the right way up. Under no circumstances may any package be moved without its pallet unless under the direct control of an authorised Thermo Fisher service engineer.

Proposed routes from the customer receiving area to the installation site must be checked for suitability. The largest pallet size should be used to calculate clearances.

WARNING: The boxed Spectrometer should be moved using a mechanical lift. Five people should be used if it has to be moved by hand taking appropriate precautions. Care should be taken in doorways, corridors or when lowering to avoid trapping fingers.

Package Size

The instrument will be supplied inside especially designed packaging. The dimensions are:

Table 3–1. Packaged Dimensions and Weight

Width	Depth	Height	Weight
980 mm	900 mm	920 mm	95 Kg
(38.6 in)	(35.4 in)	(36.2 in)	(210 Ib)

Transportation to some destinations may necessitate additional packaging, for example a packing crate. Dimensions and exact specifications may vary.

Short Term Storage

To maintain the instrument in serviceable condition and to comply with the conditions of warranty, ensure that storage of each item is maintained within the stated parameters detailed for the Working Area Requirements below. Make sure that the packages are stored the correct way up.

Note: Do not open the Packages without the permission of the Thermo Fisher engineer

When the packages are opened prior to installation, the contents will be checked against the packing list(s).

Transit Damage

Before accepting delivery of any equipment, the packages should be inspected for signs of obvious damage. The nature of the damage should be noted on the delivery notice and signed by the carrier's representative.

Within the time stated in the Thermo Fisher terms and conditions an inspection should be made for concealed damage. The local Thermo Fisher organisation should be advised of any damage in writing and, on receipt of specific instructions, the customer should return the equipment complete and in the original packing material.

Warranty

Note that the instrument is warranted against defects in material and workmanship for a period of 12 months from installation, or 15 months from shipment, whichever comes first. This warranty does not cover damage sustained as a result of improper storage by the customer prior to installation, or resale to a third party.

Note: Warranty is not transferable to a third party without Thermo Fisher approval.

Chapter 4
Working Area Requirements

The choice of site will be influenced by the dimensions and weights of the spectrometer and accessories. Other factors are the environment and the availability of electricity, water and gas supplies, as well as the need for a suitable ventilation system to dispose of the exhaust gases. All of these factors are covered in the following sections.

Pre-installation visits can be made on request, but may be chargeable.

Introduction

Prior to installation make sure that the proposed area is compatible with the conditions specified. The laboratory must offer a dry, even temperature and dust-free conditions, with no possibility of condensation forming. Sample preparation activities and corrosive materials should be located in a separate room to avoid problems due to corrosive fumes.

A comprehensive 'Risk Assessment' should be carried out that is specific to the handling of solvents, samples and sample preparation.

Particular consideration should be taken to avoid direct sunlight, proximity to heat sources, draughts and vibration. Do not locate the system where sudden changes in temperature can occur, for example near a door or window, care should be taken with the location of items such as air conditioning vents and heating vents.

Location

The instruments are designed for use on a normal laboratory bench. Ideally the instrument should be placed on a moveable bench with 0.5 meters of access behind the instrument. The mounting surface must be level and the instruments must not be placed on any type of cushioning as this could block ventilation.

The mounting arrangements should be capable of supporting the weight of the spectrometer and its accessories. Make sure that the working surface is sufficiently rigid to prevent vibration as this may affect the optical alignment of the spectrometer and accessories.

To avoid the possibility of liquid ingress into the top of the spectrometer the location should ensure it is not possible to store sample or other liquids directly above the instrumentation.

Organic or volatile solvents should not be stored, even for a short time, near the instrument.

Do not position the equipment so that it is difficult to operate the extraction, electrical supply, cooling water, purge gas and plasma gas controls.

Environmental Requirements

The atmospheric temperature requirement is 15 to 35°C (60 to 95°F), the temperature should not change by more than 2°C per hour.

Atmospheric humidity should be 20 to 80% m/v for an ambient temperature between 15 and 30°C and 20 to 60% m/v for an ambient temperature between 30 and 35°C. Atmospheric conditions must be non-condensing. The instrument room should be at a positive pressure with respect to rooms with a corrosive atmosphere.

Warning: Argon is an asphyxiant; if the extraction is turned off sufficient air must be supplied to prevent the concentration of Argon reaching a harmful level.

Electrical

The spectrometer will require an electrical supply at **200 to 240 VAC 4 KVA 50/60 Hz**. The spectrometer will be supplied with a 2.5m mains cord.

For customers in the **USA and Canada** the mains cord supplied will terminate in a NEMA L6-20P Twist&Lock plug. (Coding is black (X – ac high), white (Y – ac low), green (G – earth/ground).

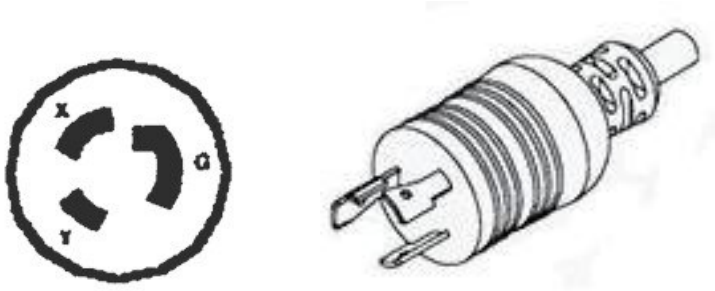

Figure 4–1. NEMA L6-20P plug for USA/Canada

For customers in the **rest of the world** the mains lead is shipped with no terminating plug, but with wires ready for a suitable 20 A plug. Coding is blue (neutral), brown (live), green/yellow (earth/ground).

Connection to the laboratory supply should be with an appropriately rated plug conforming to local electrical guide lines and local requirements. It must be possible to electrically isolate the instrumentation.

Additional standard mains sockets will be required for the Data Station PC, and for an autosampler, chiller, printer or any other additional accessory required.

Each electrical outlet must have an effective earth/ground connection. This protection must not be negated by the use of an extension cable without a protective earth conductor.

Spectrometer Size

Width	Depth	Height	Weight
832 mm	744 mm	589 mm	85.5 Kg
(32.7 in)	(29.3 in)	(23.2 in)	(188 lbs)

Table 4–2. Spectrometer Dimensions and Weight

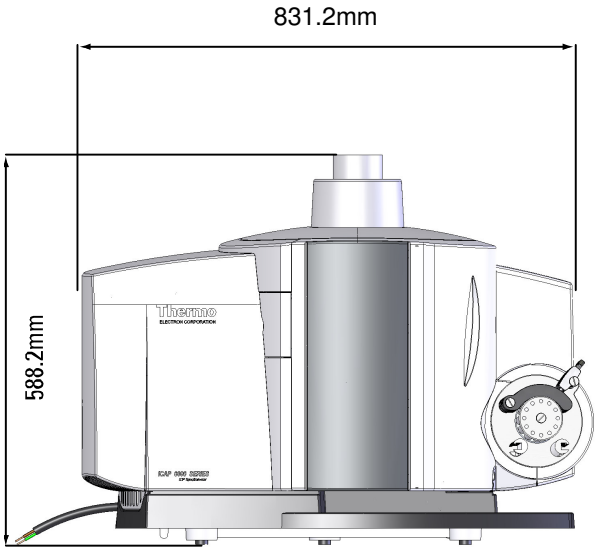

Figure 4–2. iCAP 6000 Series Front View

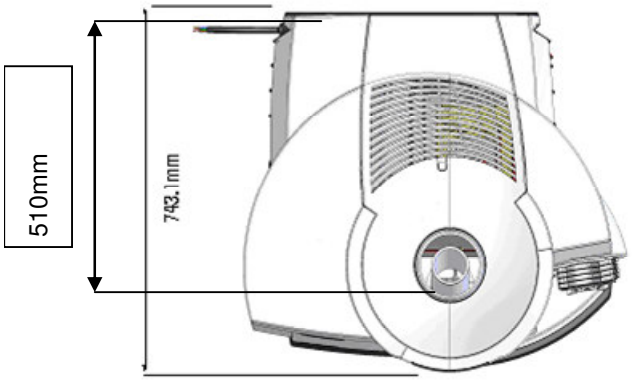

Figure 4–3. iCAP 6000 Series Top View

Gas Requirements

The spectrometer will require argon at 6 bar (87psi) (minimum quality of 99.998% pure with less than 10ppm water and less than 10ppm oxygen - used for operation and optical path purge). The maximum flow requirement will be 25 l/min during installation

For purging the optical path in the spectrometer nitrogen at 5.5 bar (80psi) (minimum quality of 99.995% pure with less than 10ppm water and less than 10ppm oxygen) can be used, instead of argon. The maximum flow requirement will be 15 l/min during installation. For optimum performance, a quality of 99.998% pure nitrogen is recommended.

If an additional gas accessory is required (optional), clean oil free air is required at a pressure of 2.5 bar (35psi) and a flow of approx 100ml.min^{-1}

The instrument will be supplied with gas tubing terminating in 6mm outside diameter gas connections (contamination free, refrigeration grade copper for the purge and plastic for the plasma gas).

Connection to the laboratory gas supply should be within 1 metre of the instrument. A regulator should be close to the connection.

Care should be taken to ensure that laboratory gas lines do not contaminate the gases used for the iCAP.

If liquid argon is not used it is recommended that banks of cylinders be used with switch over valves so that the gas supplies can be used continuously.

Warning: Nitrogen and argon gas may cause asphyxiation at high concentrations, appropriate care should be taken.

PLEASE NOTE: GAS REQUIREMENTS ARE NOT THE SAME AS FOR PREVIOUS THERMO FISHER ICP SPECTROMETERS.

Water Temperature Control

A recirculating chiller should be used to remove waste heat from the spectrometer. The water temperature should be set to 5°C below the ambient temperature.

The water used in the chiller must be distilled water containing 5% by volume of the correct inhibitor (included with maintenance kit which can be order from your local Thermo Fisher organisation).

Temperature variation must be less than 0.2°C per hour

The flow requirement of the spectrometer is 5 l/min and a cooling capacity in excess of 900 W.

A suitable chiller (ThermoFlex 900) can be supplied from your local Thermo Fisher organisation.

Requirements for ThermoFlex 900:

Power: 230 V, 50 Hz, 7 A; or 115 V, 60 Hz, 13 A

Dimensions: 69.6 x 36.1 x 62.7cm (27.4 x 14.2 x 24.7in)

The spectrometer will be supplied with plastic connecting tubing that has a 12mm **outside** diameter.

Connection to the water chiller should be within 3 meters of the instrument, or insulated tubing must be used.

Waste Storage

The analysis of a sample, by ICP-OES, usually involves production of a fine mist from a liquid sample. Waste will be produced that could be corrosive and toxic, or an organic solvent. An appropriate container is required that is solvent proof, shatterproof and vented away from the instrument. Ensure the waste container does not constitute a spill or trip hazard. It may be necessary to neutralise waste to prevent any toxin build up. Appropriate facilities should be provided for the disposal of any waste which should be disposed of following local procedures and regulations.

Spectrometer Fume Extraction

This instrumentation is designed for operation in clean air conditions. The laboratory must be free of all contaminants that could have a degrading effect on the instrument components.

Dust, acid and organic vapours must be excluded from the work area. The warranty will be void if the equipment is operated in substandard conditions.

WARNING: The spectrometer must never be operated without an effective fume extraction system attached to the torch compartment chimney.

Hot fumes, which may be corrosive and toxic, are discharged from the instrument chimney during operation. To ensure a safe working environment and safe removal of waste combustion products, an effective extraction system must be installed, this should include appropriate filtering of hazardous toxic fumes.

The extraction must be capable of exceeding the minimum required velocity, measured in the centre of the extraction tube at the spectrometer end, while disconnected from the instrument, as shown in figure 4-3 below. The extraction tube has an inlet diameter of 125 mm (5 in).

An iCAP 6000 Duo instrument will require an extraction of 10 m/s (33 ft/s; 22.4 mph)**.**

An iCAP 6000 Radial instrument will require an extraction of 5 m/s (16 ft/s; 11.2 mph)**.**

The extraction flow must be adjustable to 50% of the maximum to allow optimization during installation. This can be achieved with a butterfly valve, or an adjustable gate as shown in figure 4-3 below.

The extraction system must not be affected by external weather conditions, or other uses the system may be used for.

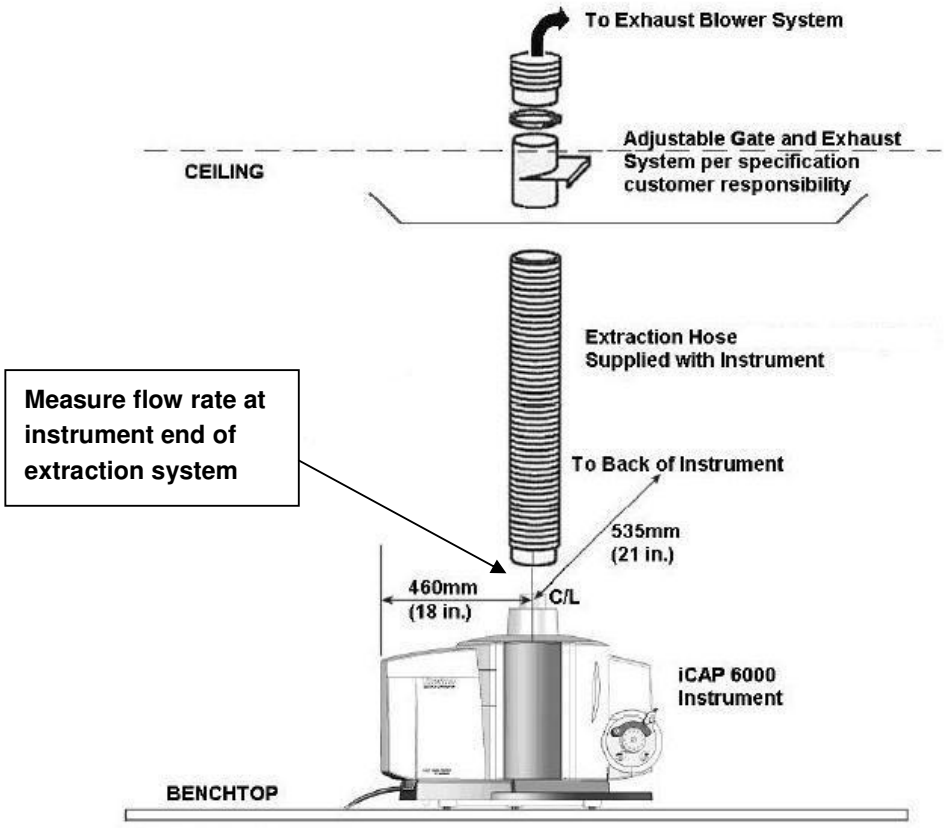

Figure 4–4. iCAP 6000 Extraction System

PLEASE NOTE: EXTRACTION REQUIREMENTS ARE NOT THE SAME AS FOR PREVIOUS THERMO FISHER ICP SPECTROMETERS.

Sample Fume Extraction

Additional, separate, extraction should be considered if significant numbers of volatile, or acidic, samples are left in the proximity of the instrumentation, even those in an autosampler.

Chapter 5
Communications Interface

On the Spectrometer

An Ethernet connection is fitted for Data Station communication

An optional accessory control PCB maybe fitted for additional the communication requirements for some accessories. The use of each connection is specified in the user manuals for each accessory.

On the Data Station

The Data Station requirements will normally be met by a PC meeting the minimum specification:

- Windows XP Professional (Service pack 2)
- 20Gb Hard drive
- 512 Mb RAM
- Dedicated Ethernet card for spectrometer communication
- Some accessories require a dedicated RS232 port
- A separate Ethernet card will be required for networking
- A printer port maybe required

A suitable PC is available from your local Thermo Fisher organisation.

The installation engineer is not responsible for network and customer specific set-up of the PC.

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Chapter 6
Pre-Installation Checklist

This checklist is to be filled in by the customer to confirm that all relevant factors concerned with the installation have been considered and dealt with.

On completion of the list, a copy should be forwarded to the local Thermo Fisher organisation with a request for installation to be carried out. Failure to send the checklist may result in delays with the instrument installation, any delays may incur extra charge.

	Required	**Completed**
Location		
Table dimensions for the spectrometer	900 x 600 mm	
Table dimension for the auto sampler (right side of the machine)	600 x 550 mm	
Extraction		
Tube diameter for extraction	125 mm	
Extraction capability	10 m/s (Duo) 5 m/s (Radial)	
Adjustable valve in the extraction tube	Yes	
Electrical supply		
Plug 200-240 VAC, 32A single phase 4000W, 50Hz	Yes	
Standard mains plug 200-240 VAC for each accessory	Yes	
Argon Gas		
Regulator valve in the wall 0 -10 bars (0 – 100 PSI)	Yes	
Gas union dimension at the exit of the regulator valve	6 mm (1/4 inch adapter supplied with instrument)	
Maximum distance between the instrument and the regulator valve	2 m	
Purity of argon (Gas or Liquid)	99,995% 0_2<10 ppm H_20<10 ppm	
Pressure required at the input of spectrometer	6 bars (87 Psi)	

Optic nitrogen purge (Optional)		
Regulator valve in wall 0 – 10 bars (0 – 100 Psi)	Yes	
Gas union dimension at the exit of the regulator valve	6 mm (1/4 inch adapter supplied with instrument)	
Maximum distance between the instrument and the regulator valve	2 m	
Purity of nitrogen (Gas or Liquid)	99,995% 0_2<10 ppm H_20<10 ppm	
Pressure required at the input of spectrometer	6 bar (87 Psi)	
Waste		
Waste container, a minimum of 5 l for liquids waste	Yes	
Auto Sampler rinse and waste		
Minimum 1l container for the rinse supply station and waste	2 needed	
Chiller (if not bought with the instrument)		
Maximum distance from the spectrometer	3 m	
Pipe supply O.D. dimension	12 mm	
Cooling capability	900 W	
Flow rate	5 l/min	
Chiller inhibitor	Yes	
PC and printer (if not bought with the machine)		
512 Mb RAM, 40 Gb HDD, 2 Ethernet ports, 1 serial port, USB ports, monitor, ink jet printer	Yes	
Windows XP Professional (Service pack 2)	Yes	

Caution: The instrument installation will not start before Thermo Fisher receives this document back completed. In the case of false information causing the installation to be stopped, a travel cost may be charged.

I certify the exactness of the information supplied in this document.

Name: **Position:**

Signature: **Company stamp:**

Date:

Chapter 7
Special Agreements

This section should detail any special agreements, which have been arranged with your local Thermo Fisher organisation.